REMARKS

Claims 1-3 and 6 are pending in this application. An amendment is proposed herein canceling claims 2 and 3 without prejudice or disclaimer, and amending claims 1 and 6. Upon entry of this amendment, claims 1 and 6 will be pending. Entry of this amendment and reconsideration of the rejections are respectfully requested.

No new matter has been introduced by this Amendment. Support for the amendments to the claims is detailed below.

Claims 1-3 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. (Office Action paragraph no. 3)

The Examiner states that the phrase "having been formed like a single film or board" is unclear, asking if this means that "it was produced using the same equipment and/or operating conditions as single film or board."

The rejection is overcome by the amendment to claim 1, as follows: "... the heat shielding layer ~~having been formed like~~ being in the form of a single film or board ...." Claim 6 is similarly amended, and is amended: "a ~~film- or board-like~~ matrix material in the form of a film or board."

Support for this amendment may be found in original claim 6, which recites "a film- or board-like form consisting of the heat shielding layer." That is, the phrase refers to the structural

form of the material, and not to the manufacturing method, and the amendments to claims 1 and 6 clarify that this is an explicit structural limitation and not a product-by-process limitation.

Claims 1-3 and 6 are rejected under 35 U.S.C. 103(a), as being unpatentable over Fisher (US 2002/0086926) in view of Friedman et al. (US 2003/0162028). (Office Action paragraph no. 5)

The rejection is moot for claims 2 and 3, which have been canceled without prejudice or disclaimer. The rejection of claims 1 and 6 is overcome by the amendments to these claims.

Claims 1 and 6 have each been amended to recite: "wherein the heat shielding material for use in an agricultural and horticultural facility has a visible light transmittance in the range of 60 to 90%, a solar radiation transmittance in the range of 10 to 80%, a light transmittance in the range of 5 to 80% at a wavelength of 320 nm in an ultraviolet region, and a light transmittance in the range of 3.4 to 70% at a wavelength of 290 nm in an ultraviolet region." Support for this amendment may be found in canceled claims 2 and 3, and in the specification, as follows: The lower-limit light transmittance at a wavelength of 290 nm, i.e., "3.4%," is supported by the data collected from Example 4, and the lower-limit visible light transmittance, i.e., "60%," is supported by the disclosure of the specification on page 12, lines 4-5, that "the visible light transmittance is preferably in the range of 30 to 90%, more preferably 60 to 90%, ..."

Applicant respectfully argues that there are **unexpected results** associated with the recited combination of the heat shielding filler, "lanthanum hexaboride or antimony-doped tin oxide,"and base resin, "fluorine type resin." Specifically, the characteristics recited in the clause added in the amendments to claims 1 and 6 are unexpected, such that the unexpected results are commensurate in scope with the claims.

Support for the unexpected results in the present specification is detailed here:

First of all, the specification on page 6, line 24 to page 7, line 10, states that:

> "In a heat shielding material for use in an agricultural and horticultural facility, a sort of heat targeted for shielding is heat energy derived from sunrays. The sunrays reaching the ground level are said to lie generally in a wavelength band of about 290 to 2100 nm, among which light converged in a visible light wavelength band of about 380 to 780 nm is required to keep brightness in the facility and to grow plants. In order to shield heat from the sunrays, therefore, it is preferred that a material be chosen which is capable of selective and efficient absorption of near-infrared light of about 780 to 2100 nm and hence of making contributions to a heat shielding property."

That is to say, the heat shielding material for use in an agricultural and horticultural facility must have a transmittance that allows light in a visible light wavelength band of about 380 to 780 nm to be transmitted as required to keep desired brightness in the facility, and an absorption that allows near-infrared light of about 780 to 2100 nm to be absorbed as required to exert heat shielding effect at a high level.

Secondly, the specification on page 7, lines 11-24, states that:

> "Meanwhile, as regards light in an ultraviolet region, a wavelength band of 290 to 320 nm must usually be controlled although optimum cultivation conditions exist depending upon the breed of plants to be cultivated, the species of insects to be used

> for pollination, etc. In other words, this is because damage caused by noxious insects and plant diseases can be effectively inhibited by screening an appropriate quantity of ultraviolet rays in the above wavelength band. Many of the conventional agricultural films may screen ultraviolet rays up to a certain point, and therefore, plants bred under such conditions do not need a lot of ultraviolet rays when grown. However, it is not desirable to screen a majority of ultraviolet rays because active pollination by insects such as honeybees or the like cannot be accomplished, or plant growth is impaired."

That is to say, the heat shielding material for use in an agricultural and horticultural facility must usually control a wavelength band of 290 to 320 nm. The reason for this is that screening an appropriate quantity of ultraviolet rays in such a wavelength band is effective in inhibiting damage from being caused by noxious insects and plant diseases.

However, screening a majority of ultraviolet rays is not preferred since this causes inactivated pollination by insects such as honeybees or the like, or impaired growth of plants. Ultraviolet rays must therefore be screened by an appropriate quantity (that is, a modest level of light transmittance is needed to such an extent that a light transmittance in an ultraviolet region is made larger than 0%).

Conclusively, the heat shielding material for use in an agricultural and horticultural facility must simultaneously have three different characteristics, that is, a transmittance in a visible light region as required to hold desired brightness, an absorption in a near-infrared region as required to exert heat shielding effect at a high level, and a transmittance in an ultraviolet region.

However, when the "polyethylene terephthalate resin" is used as the base resin, the light transmittance at a wavelength of 290 nm in an ultraviolet region comes to 0% as discussed above.

The heat shielding material for use in an agricultural and horticultural facility according to the present invention has such characteristics as a visible light transmittance of 60 to 90%, a solar radiation transmittance of 10 to 80%, a light transmittance of 5 to 80% at a wavelength of 320 nm in an ultraviolet region, and a light transmittance of 3.4 to 70% at a wavelength of 290 nm in an ultraviolet region. The heat shielding material of this invention is uniquely effective since it has the above-noted three characteristics simultaneously, which are necessary for this type of heat shielding material for use in an agricultural and horticultural facility.

The fact that the heat shielding material of the present invention meets these three simultaneous characteristics can clearly be confirmed by the data in the specification for Examples 1, 2, 4 and 5, in which ETFE, "fluorine type resin," was used as the base resin. Support for these results may also be found in the disclosure of the specification, as follows:

Firstly, the specification on page 7, line 25 to page 8, line 15 states that:

> "As shown in Fig. 1, each transmittance spectrum of a film, which has **the LaB_6 microparticles** dispersed therein, **has a high transmittance with respect to the light in a visible light region** and has a transmittance peak in the vicinity of a wavelength of 550 nm. This transmittance peak is favorable in holding brightness inside the facility since it is comparable to the wavelength at which the eye sensitivity to light is maximal. Further, a high absorption seen in the vicinity of a wavelength of 1000 nm makes it clear that **near-infrared light can be efficiently absorbed** in such a degree as to efficiently shield heat energy induced from sunrays. Additionally, LaB_6 is **less likely to absorb ultraviolet rays and does not adversely affect pollination by insects and growth of plants**. The tendency for ultraviolet rays at a wavelength of 290 to 320 nm to transmit can be controlled by adjusting the amount of the LaB_6 microparticles to be added to a base resin." (emphasis added)

This means that the heat shielding material for use in an agricultural and horticultural facility of the present invention, designed to use LaB_6 microparticles, has three such simultaneous characteristics, that is, a transmittance in a visible light region, an absorption in a near-infrared region, and a transmittance in an ultraviolet region.

Secondly, the specification on page 9, line 18 to page 10, line 5 states that:

> "In addition, the transmittance spectra of a film having **the ATO microparticles** dispersed therein are shown in Fig. 2. As is clear from Fig. 2, this film **indicates a transmittance profile with a high transmittance** at a wavelength of 380 to 780 nm **in a visible light region and a flat one**. The film is virtually free from absorbing a visible light region and is capable of holding brightness in the facility. Simultaneously, it **has an absorbance** at a wavelength of not smaller than 800 nm **in a near-infrared region**, thus affording a high level of heat shielding effect. Moreover, the film **affords a transmittance at a wavelength of 290 to 320 nm in an ultraviolet region** and does not nearly have adverse effects on honeybees and the like working for pollination." (emphasis added)

This means that the heat shielding material for use in an agricultural and horticultural facility of the present invention, designed to use the ATO microparticles, also has three such simultaneous characteristics, that is, a transmittance in a visible light region, an absorption in a near-infrared region, and a transmittance in an ultraviolet region.

Thirdly, the specification on page 10, line 20 to page 11, line 6 states that:

> "Additionally, as the heat shielding filler, **LaB_6 and ATO can be used in combination**, and the combined use provides a heat shielding material having a heat shielding property with greater effectiveness. More specifically, as seen in Figs. 1 and 2, LaB_6 has a higher absorption in the vicinity of a wavelength of 1000 nm, while ATO shows a gradual increase in absorption at a wavelength of 800 nm or above. Therefore, when both types of the microparticles are dispersed in a base resin, the absorption in a near-infrared region is made higher and more efficient so that a heat

> **shielding property is obtained at a higher level** than that obtained in the instance where either one type of the microparticles is used." (emphasis added)

This means that the heat shielding material for use in an agricultural and horticultural facility of the present invention, designed to use both of the lanthanum hexaboride microparticles and the antimony-doped tin oxide microparticles at a time, also has the above-noted three simultaneous characteristics.

Lastly, the specification on page 11, line 24 to page 12, line 11 states that:

> "In the heat shielding material for use in an agricultural and horticultural facility according to the present invention, **it is important that, from optical points of view, a good balance be achieved between the transmittance in a visible light region and the absorption in a near-infrared region**. Namely, the visible light transmittance is preferably in the range of 30 to 90%, more preferably 60 to 90%, and simultaneously, **the solar radiation transmittance** is preferably in the range of **10 to 80%**, more preferably 10 to 70%. As to the light transmittance in an ultraviolet region, the light transmittance at a wavelength of 320 nm is preferably in the range of 5 to 80%, and **the light transmittance at a wavelength of 290 nm** is preferably in the range of **0 to 70%**." (emphasis added)

This means that the heat shielding material for use in an agricultural and horticultural facility of the present invention is also properly balanced between the transmittance in a visible light region and the absorption in a near-infrared region.

The heat shielding material for use in an agricultural and horticultural facility according to the present invention has three simultaneous characteristics, that is, the transmittance in a visible light region as required to hold desired brightness, the absorption in a near-infrared region as required to exert heat shielding effect at a high level, and the transmittance in an ultraviolet region.

And so, this heat shielding material is significantly useful as a roofing material, an outer wall material, etc., in an agricultural and horticultural facility such as a house or the like (see the specification on page 11, lines 7-23).

The rejection is based on the substitution of Fisher's resin, which may be polyvinyl butyral, with a fluorine type resin, as taught by Friedman. Friedman discloses that polyvinyl butyral and fluoropolymers may be used as interlayers in glazing laminates, and the Examiner states that Friedman shows that these are "functionally equivalent." However, Applicant submits that these do not behave equivalently in combination with the heat shielding filler of the present claims, and that the effects resulting from the combination of the present invention are unexpected over the references.

That is, the characteristics recited in the last clauses of claims 1 and 6, associated with the combination of limitations of the present claims, are completely unexpected based on the teachings of Fisher '926 and Friedman et al. '028, and represent unexpected results commensurate with the present claims. Claims 1 and 6, as amended, are therefore not obvious over Fisher '926 and Friedman et al. '028, taken separately or in combination.

Claims 1-3 and 6 are rejected under 35 U.S.C. 103(a), as being unpatentable over Kase et al. (US 5,925,453) in view of Kunimatsu et al. (US 5,807,511). (Office Action paragraph no. 6)

Reconsideration of the rejection is respectfully requested in view of the amendments to the claims.

As discussed above, the heat shielding material for use in an agricultural and horticultural facility of the present invention, designed to use "lanthanum hexaboride or antimony-doped tin oxide" as the heat shielding filler, and "fluorine type resin" as the base resin, is markedly effective since it has three such simultaneous characteristics, that is, the transmittance in a visible light region as required to hold desired brightness, the absorption in a near-infrared region as required to exert heat shielding effect at a high level, and the transmittance in an ultraviolet region.

Applicant submits that these three simultaneous characteristics are completely unexpected over Kase et al. '453 and Kunimatsu et al. '511, and pending claims 1 and 6, as amended, are not obvious over Kase et al. '453 and Kunimatsu et al. '511, taken separately or in combination.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the applicant's undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosure: Petition for Extension of Time

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